



Sent By E-Mail

October 31, 2007

The Honorable Deborah Taylor Tate
Federal Communications Commission
445 12th Street SW
Room 8-A204
Washington, DC 20554

Dear Commissioner Tate:

Many thanks again to you and Chris for meeting with us about Nortel's Net Neutrality position paper and the current trends in the telecom industry.

I wanted to follow up with you on the subject of the emerging "White Spaces" domain.

There is no doubt that reuse of the white spaces between active television channels and the potential challenges of new technologies to exploit this opportunity make for a highly interesting discussion. At the same time, the commercial and technology initiatives that are beginning to ramp up to capitalize on this new domain are, for the most part, being driven by non-wireless companies. This dialogue would be more complete with additional participation by the wireless industry and other technology companies.

Utilizing the white spaces between channels is an area being watched closely by all of us in the industry. At Nortel, we are also evaluating the technology requirements to address the opportunities. We are particularly excited about the potential for new broadband capability in enterprise and residential applications.

I'd like to share with you some of our preliminary evaluations of this space and some thoughts on the technology challenges ahead.

1) Integrated end-to-end carrier-grade network solution

Because of Nortel's extensive experience in developing and deploying global mobile communications networks, we understand the importance and necessity of ensuring end-to-end system performance. We also understand – as a result of our depth and breadth of RF expertise and our knowledge of the technical aspects of radio propagation and inter-system interference – the challenges of delivering that end-to-end performance and the actual requirements to deliver



carrier-grade network performance and capacity. These are important considerations to achieve efficient utilization of the white space channels, while at the same time satisfactorily protecting existing authorized operations and devices in the band.

Although a number of initiatives currently underway in the industry are focused on addressing some of these challenges, they are at a very basic technology level. The IEEE 802.22 group, for example, is focused on developing a radio signal interface for use in white spaces, and the White Spaces Coalition is seeking to demonstrate the capability to use signal detection algorithms to determine if a channel is free. Although signal sensing is an important aspect of discovering white space channels, it is Nortel's view that broadcast services cannot be adequately protected with a single technology. Although that would be ideal, the physics of radio propagation do not permit, for example, hidden receiver nodes to be protected simply by sensing TV or wireless microphone signals.

As the Commission discusses within the various Reports and Orders (R&Os) and Notices of Proposed Rulemaking (NPRMs), a combination of signal sensing, geographic location information, and knowledge about the current locally active channels is required to ensure there is no harmful interference to the TV receivers and other authorized users and devices. In order to fully exploit this information and to facilitate the use of white space channels, we also believe it is essential to integrate network planning, deployment and support capabilities. In next-generation technology that will be available in the near future, we expect that these three elements will be combined into an intelligent cognitive radio system that will effectively utilize the white space channels.

2) Spectrum efficiency

The future RF technology being developed is based on advances that enable ever higher efficiency in use of the spectrum. The technology for white space systems should be no different. As a result, for better utilization of the sporadic spectrum resource in the white spaces, we believe the industry will exploit higher spectral efficiency air-interface technology that is comparable to, or better than, 4G wireless technologies (i.e., greater than 1.5 bits/Hz/second for the downlink aggregated sector throughput). In addition, due to the nature of the non-uniform availability of spectrum in white spaces across the network, in order to provide seamless connectivity and service for the end-user and to support the roaming of multi-mode devices, white space broadband networks must be capable of inter-radio access technology (RAT) measurement and handover. Consequently, a fixed and mobile converged (FMC) network solution, in our view, will be the most suitable for white space broadband networking.



3) RF Co-existence

Although the protection of broadcast and other authorized services is basic to the utilization of the white spaces, it is also important that new white space systems can coexist with one another and support interoperability. A number of design factors contribute to such coexistence and interoperability, including the following:

- (a) Because multiple white space systems may seek to occupy the same channels, they should not block each other if they are in the same or nearby areas. With the single occupancy detection threshold and monitoring time proposed in the draft rules, however, multiple white space systems will detect each other's signals and thereby block themselves from access. Supporting multiple white space systems in a common area will therefore require the ability to detect and distinguish the broadcast services' signals from the white space systems' signals. Some standardized white space signal formats, as one solution, may assist in this detection and coexistence.
- (b) Monitoring and access times also should be commensurate with the packet transmission times in radio systems. Because these typically are a few tens or hundreds of milliseconds per burst, the proposed 30-second channel availability check time may be inefficient. To support efficient packet burst transmissions, it may be useful for the channel monitoring intervals during a traffic burst to be different from those used for an initial channel availability check.
- (c) Although the protection of broadcast and other authorized services can be achieved by restricting white space systems to fixed operation, it is also appropriate that the use of low-power portable devices be permitted as long as they are in communication and under supervision of a fixed station and are within the safe operating zone established for that station and the white space channel as proposed in the initial NPRM. In this mode of operation, portable devices would operate at a lower power level than fixed stations. Approval of this option would significantly expand the application and service opportunities for white space systems. The availability of current information on active broadcast systems and their coverage regions should be made available to white spaces system operations to support this capability. This may include, for example, a national database.
- (d) Interoperability is also an important aspect of delivering ubiquitous, reliable services to users. Moreover, modern communications systems are expected to function across multiple applications and multiple locations. Such functioning is made possible today by the use of suitable standards that enable low-cost and ubiquitous communications. The application of



such interoperability standards should be encouraged and supported though the rules of operation for white space channels.

Taken together, these additional features will assure that white space systems can support multiple applications and systems and provide multiple services to users.

4) Spectrum Licensing

We are encouraged by the FCC's effort to ensure open access of the white space spectrum for unlicensed users. This initiative will facilitate the future improvement of spectrum resource utilization and new services. As discussed in the Further NPRM, we generally prefer that the spectrum be "unlicensed". An "unlicensed" designation greatly simplifies and lowers the cost of testing, distribution, installation and utilization for white space systems. However, given the potential for inter-white space system interference and blocking (mentioned above), we suggest that appropriate allocations of responsibility among users to mutually resolve interference cases be included in the white space rules of operation (such as outlined for the "lightly-licensed" 3650-3700 MHz band). Such responsibility and capability would assure the most flexible use of the spectrum and its availability to as many new users and applications as possible.

Furthermore, we encourage further industry dialogue, investigation, and comparison of the technologies of choice (e.g., IEEE 802.16, IEEE 802.22, and IEEE 802.11) to assure the best technology solution possible while meeting the specific requirement for sharing the white space spectrum.

5) Open Standards

To make white space broadband networking a large-scale commercial success, reliability, interoperability and certification will be critical factors. Nortel therefore encourages the industry to develop (by consensus), open, standards-based technologies and solutions that will enable mass-market adoption. Without such standardization, we run the risk of market fragmentation and niche solutions that do not achieve the high levels of ubiquity, interoperability and reliability required by today's communications users. Without standardization, this highly prized spectrum resource will be underutilized. We would strongly recommend that the FCC not make this spectrum available until standardization is achieved. Standardization will ensure interoperability, high performance, scalability, low-cost, mass-market adoption, and commercial success.

Clearly, there remains much more to consider from a technology perspective for the white spaces domain. From Nortel's perspective, it is important that any



FCC decision with regard to the use of the white spaces be made on a sound technical basis as recommended by the FCC's Office of Engineering and Technology.

Nortel is excited by the potential of the white space channel availability and will continue to review the subject and to contribute knowledge and technical solutions.

I welcome further discussion with you and your staff and would be happy to answer any questions you may have and to provide additional information.

We will file this letter in the current white spaces proceeding, ET Docket No. 04-186, and provide copies to the Chairman and other Commissioners, as well as to the Chief, Office of Engineering and Technology so that they, too, will have Nortel's views on this important subject.

Sincerely,

/s/ John Roesse

John Roesse
Chief Technology Officer
Copy:
Chris Moore, Legal Advisor